

## FOSSIL NEMOPTERIDAE (NEUROPTERA).<sup>1</sup>

BY F. M. CARPENTER

Harvard University

The living members of the neuropterous family Nemopteridae have a wide but irregular geographical distribution. Although they occur in southern Europe, Asia Minor, India, South America and Africa, they have not been found in North America. However, a fossil species, *Halter americana*, was described by Cockerell in 1907 from the Florissant shales in Colorado.<sup>2</sup> The published description of this fossil, unfortunately, was too brief and incomplete to be of use to specialists on Nemopteridae. Navas, who subsequently examined the type specimen in the British Museum (Natural History), published a new, but very inadequate, account of the fossil in 1913, erected a new genus, *Marquettia*, for it, and included a rough figure of the fore wing. The present paper is a more detailed description of the specimen, made in connection with my preparation of the insect part of the Treatise on Invertebrate Palaeontology.

I examined the type of *americana* in the British Museum in 1938, and Dr. R. Baker, of the Department of Palaeontology of the Museum, has recently sent me a series of excellent photographs of it. A second specimen of *americana*, contained in the Natural History Museum of the University of Colorado, has been loaned to me for study by the director of the Museum, Dr. Hugo Rodeck; it has added some significant features to our knowledge of the species. I have taken this occasion to discuss briefly the nemopterid *Olivierina metzeli*, which Pierce and Kirkby have recently described from an Oligocene deposit in Montana.

Unfortunately, the generic classification of the living Nemopteridae is far from satisfactory. Navas' two revisional studies were published nearly fifty years ago (1910, 1912), and the generic classification included there was mainly an arbitrary one. The genera were based almost entirely upon the shapes of the hind wings, without regard to the probably occurrence of convergence in several lines of evolution. The venation of the fore wing is surprisingly constant throughout the entire group with the exception of a very few species in which the

---

<sup>1</sup>Published with the aid of a grant from the Museum of Comparative Zoology at Harvard College.

<sup>2</sup>This fossil naturally aroused much interest. It was selected by the editors of the Entomological News (19:34, 1908) as the most remarkable insect made known during the year 1907, and it was reproduced on the cover of the issues of the News for 1908.

pattern is much reduced. A satisfactory generic classification of the nemopterids will almost certainly not be achieved until the terminal abdominal segments of the males have been studied in detail for the majority of the species described from all parts of the world. The generic assignments of the fossils discussed below must, of course, be made mainly on the basis of the venation of the fore wing and the general shape of the hind wing, these being the characteristics which have been used in the classification of the living species up to the present time.

#### Genus *Marquettia* Navas

Navas, 1913, Mem. Real Acad. Cien. y Artes de Barcelona, 10:7

Head shaped much as in *Lertha*, the rostrum present but not elongate. Front wing broadly oval, with a venational pattern more or less characteristic of that found in the tribe Stenonemiini (Orfila, 1954). The radial sector is extensively branched, having ten main branches in addition to the anterior media.<sup>3</sup> The pterostigma is small and it was probably very light in color in the living insect, as in *Lertha*. The hind wing is slender, about the same as in *Kirbynia* in general form, except that it has a more rounded apex, like that of *Olivierina* and *Halterina*; it has two dilations, the dilated portion being nearly uniformly dark in color.

Type species: *Halter americana* Cockerell.

As pointed out above, this genus is related, so far as we can see from the known structure, to several stenonemiine genera, but it stands apart from all of these by the extensive development of the radial sector. In this respect, I consider the genus *Marquettia* to be the most primitive of the genera of the Nemopteridae known at the present time.

#### *Marquettia americana* (Cockerell)

Plate I and text figure 1.

*Halter americana* Cockerell, 1907, Science, 26:466

*Halter americana* Cockerell, 1908, Pop. Sci. Mo., 72: 125

*Marquettia americana* Navas, 1913, Mem. Real Acad. Cien. y Artes de Barcelona, 10:484, fig. 4.

Fore wing, length, 31 mm.; width, 10 mm. Length of hind wing, 44 mm.; length of body, 16 mm.; length of beak, 2.5 mm. The vena-

<sup>3</sup>I have used here the venational nomenclature proposed by Dr. P. A. Adams in his "Studies in the Neuroptera, with Special Reference to Wing Structure and Evolution in the Osmoidea" (unpublished doctoral thesis, Harvard University, June 1958).

tion is typical of that of the tribe Stenonemiini, as shown in text figure 1, with the exception of the presence of the numerous branches of the radial sector. The hind wing, which is about one and one-half times the length of the fore wing, has a slender petiole and terminates in two conspicuous dilations. The distal dilation appears to be at the termination of the wing; there does not seem to be a terminal extension, tapering more nearly to a point, as Navas indicated by dotted lines in his figure 4 (1913). The two dilations are almost certainly somewhat twisted as the fossil is preserved; this, of course, is what one would expect from the condition of the hind wing as it occurs in most living specimens of the family. The petiole of the wing is hyaline, but the two dilations are almost solidly dark in color, although there is an indication of a small hyaline area in the region of the twisting; this light area could, of course, be due to peculiarities of preservation, although the two light areas are in the same position in both of the hind wings.

**Holotype:** This consists of a nearly complete specimen with all four wings outstretched (plate 1), with the venation of the front wings very clear; collected in the Florissant shales, Colorado;<sup>4</sup> deposited in the Department of Palaeontology, British Museum (Natural History).

The species which Pierce and Kirkby described (1959) from Oligocene shales in Montana as *Olivierina metzeli* is apparently closely related to *americana* and may in fact be that species. The size of the insect is virtually identical with that of *americana*. Unfortunately, the specimen on which the *metzeli* is based is poorly preserved; the venation of the fore wing is not discernible, and the form of the hind wing is not clearly shown. The authors state that the dilated part of the hind wing narrows for a short distance and widens again to a narrow inflation. Mrs. Kirkby informs me that, though the apical portion is not complete in the type specimen, there is enough evidence preserved to show that the "paddle" widens again. Pierce and Kirkby apparently incorrectly interpreted Cockerell's description of his *americana* and they were unaware of Navas' published redescription of *americana* and of his establishment of the genus *Marquettia*. In his account of *americana*, Cockerell stated that the black area of

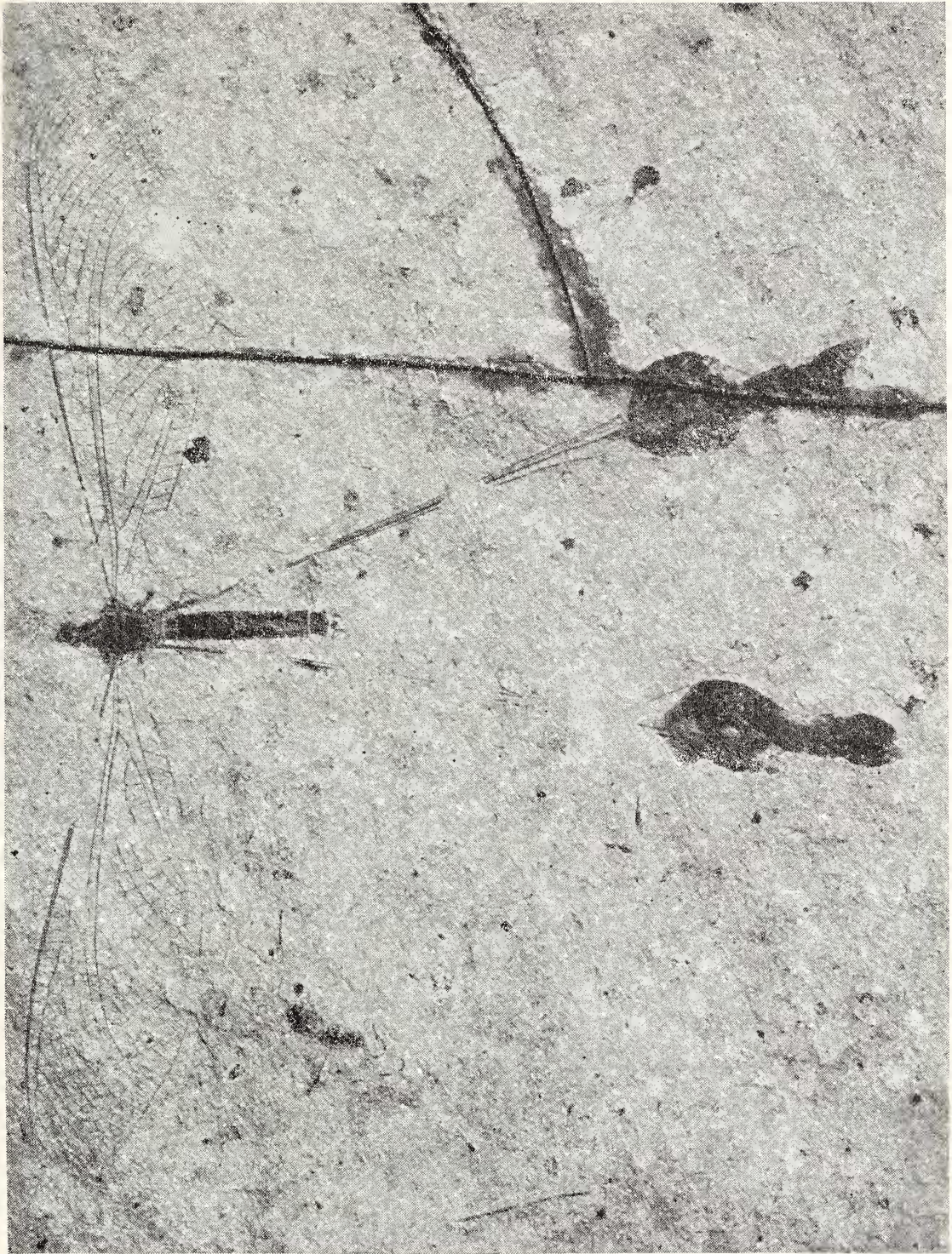
---

<sup>4</sup>Formerly thought to be of Miocene age but now usually considered Oligocene.

---

#### EXPLANATION OF PLATE 1

*Marquettia americana* (Cock.). Photograph of holotype [Courtesy of British Museum (Natural History)].

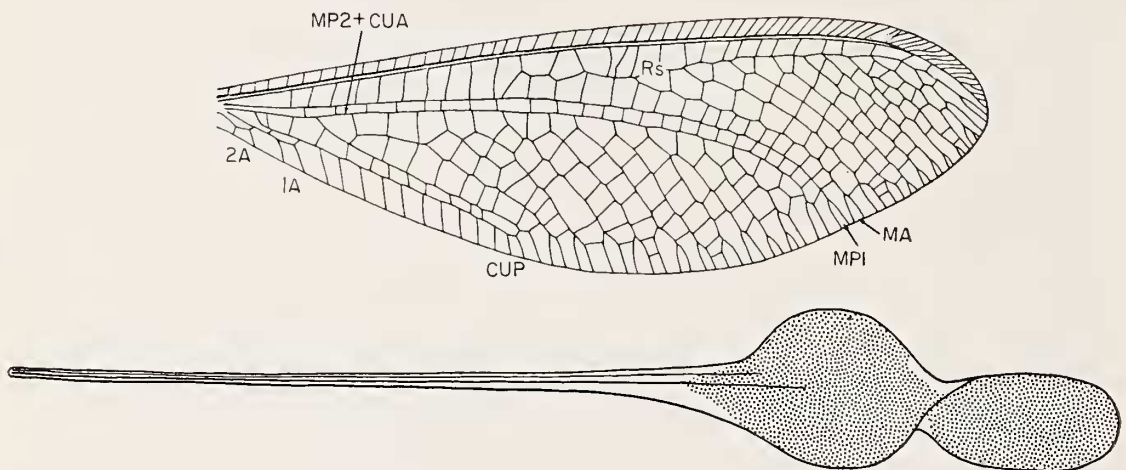


CARPENTER — FOSSIL NEMOPTERIDAE

the hind wing was solid and continuous, not broken into two as in the living *Halter extensa*. That he was referring to the interruption of the *black area* and not to the "paddle" is shown by his previous statement that the hind wing had an apical fiddle-shaped expansion, which was dark-colored. Pierce and Kirkby apparently concluded that *americana* had a single, undivided dilation. The two dilations are shown in Navas' figure of the type (1913).

Since *metzeli* has two dilations of the hind wing, as in *americana*, and resembles that species in all other known features, it may most reasonably be placed in the genus *Marquettia*, to which it is hereby assigned.

A generic revision of all known nemopterids may result in considerably generic synonymy, with *Marquettia* included. However, until such a revision is made, I believe *Marquettia* should be retained for these two fossil Nearctic species.



Text figure 1. Fore and hind wings of *Marquettia americana* (Cock.). Drawing based mainly on holotype, with additional details of specimen no. 4514, University of Colorado Museum.

#### REFERENCES

- COCKERELL, T. D. A., 1907, Some Old World Types of Insects in the Miocene of Colorado, *Science*, 26: 446-447.  
 1908, *Florissant: A Miocene Pompeii*, *Pop. Sci. Mo.*, 73: 124-125.
- NAVAS, R. P. L., 1910. *Monografía de los Nemopteridos*, *Mem. Real Acad. Cien. y Artes de Barcelona*, 8: 341-408.  
 1912, *Family Nemopteridae*, *Neuroptera, Genera Insectorum*, 136: 1-23.  
 1913, *Mis Excursiones por el Extranjero*, *Mem. Real Acad. Cien. y Artes*, 10: 7-9, fig. 4.
- ORFILA, R. N., 1954, Un Nuevo "Nemopteridae" Americano, *Rev. Soc. Ent. Argentina*, 17: 29-32.
- PIERCE, W. DWIGHT and RUTH A. KIRKBY, 1959, Fossil Insects from Montana: A New Fossil Nemopterid (Neuroptera), *Bull. So. Calif. Acad. Sci.*, 58: 47-50.